

WHAT IS CLAIMED IS:

1. An image processing apparatus comprising:

a memory which stores a plurality of first images
obtained by photographing an object to be rendered from
5 a plurality of different photographing directions, and
second images that pertain to geometry information of
the object to be rendered;

a geometrical shape model generation unit which
generates a geometrical shape model of the object to be
10 rendered on the basis of the second images;

a microfacet generation unit which generates a
plurality of microfacets used to approximate a shape of
the geometrical shape model;

a billboard processing unit which rotates the
15 plurality of microfacets to make a predetermined angle
with a view direction; and

a texture mapping unit which generates a third
image associated with the object to be rendered in
correspondence with the view direction by selecting
20 texture images for respective microfacets from the
plurality of first images on the basis of the plurality
of photographing directions and view direction, and
by projecting the selected texture images onto the
microfacets.

25 2. An apparatus according to claim 1, wherein
the geometrical shape model generation unit generates
a plurality of voxels, and generates the geometrical

shape model using the plurality of voxels, and
the microfacet generation unit generates the
microfacets in the respective voxels.

3. An apparatus according to claim 2, wherein
5 the geometrical shape model generation unit controls
the number of voxels to be generated on the basis of
precision of the second images.

4. An apparatus according to claim 2, further
comprising a clipping processing unit which appends
10 geometry information to each pixel of the plurality of
first images on the basis of the second images, and
executes a clipping process of the plurality of first
images on the basis of the geometry information of each
pixel of each first image and a distance from a
15 viewpoint to each voxel.

5. An apparatus according to claim 1, further
comprising an interpolated image generation unit which
selects at least two first images in ascending order
of angle that the view direction and the plurality
20 of photographing directions make, and generates an
interpolated image on the basis of the at least two
first images, and

wherein the texture mapping unit selects the
texture images for respective microfacets from the
25 plurality of first images or the interpolated image on
the basis of the plurality of photographing directions
and view direction, and projects the selected texture

images onto the microfacets.

6. An apparatus according to claim 5, further comprising a clipping processing unit which appends geometry information to each pixel of the plurality of first images and the interpolated image on the basis of the second images, and executes a clipping process of the plurality of first images on the basis of the geometry information of each pixel of each first image and the interpolated image, and a distance from a viewpoint to each voxel.

7. An apparatus according to claim 4, wherein the clipping processing unit comprises graphics hardware.

8. An image processing method for generating an image from a predetermined view direction in association with an object to be rendered, comprising:

generating a plurality of first images obtained by photographing the object to be rendered from a plurality of different directions, and second images that pertains to geometry information of the object to be rendered;

generating a geometrical shape model of the object to be rendered on the basis of the second images;

generating a plurality of microfacets used to approximate a shape of the geometrical shape model;

executing a billboarding process that rotates the plurality of microfacets to make a predetermined angle with a view direction; and

generating a third image by selecting texture images for respective microfacets from the plurality of first images on the basis of the plurality of photographing directions and view direction, and by
5 projecting the selected texture images onto the microfacets.

9. A method according to claim 8, wherein the geometrical shape model is a voxel model formed of a plurality of voxels, and

10 the microfacets are generated for respective voxels.

10. A method according to claim 9, wherein the step of generating the geometrical shape mode includes the step of controlling the number of voxels to be
15 generated on the basis of precision of the second images.

11. A method according to claim 9, further comprising appending geometry information to each pixel of the plurality of first images on the basis of the
20 second images, and executing a clipping process of the plurality of first images on the basis of the geometry information of each pixel of each first image and a distance from a viewpoint to each voxel.

12. A method according to claim 8, further
25 comprising selecting at least two first images in ascending order of angle that the view direction and the plurality of photographing directions make, and

generating an interpolated image on the basis of the
at least two first images, and

wherein in texture mapping, the texture images are
selected for respective microfacets from the plurality
5 of first images or the interpolated image on the basis
of the plurality of photographing directions and view
direction, and the selected texture images are
projected onto the microfacets.

13. A method according to claim 12, further
10 comprising appending geometry information to each pixel
of the plurality of first images and the interpolated
image on the basis of the second images, and executing
a clipping process of the plurality of first images on
the basis of the geometry information of each pixel of
15 each first image and the interpolated image, and a
distance from a viewpoint to each voxel.

14. A computer program product configured to store
program instructions for generating an image from
a predetermined view direction in association with
20 an object to be rendered using a plurality of first
images obtained by photographing the object to be
rendered from a plurality of different directions, and
second images that pertains to geometry information of
the object to be rendered, on a computer system
25 enabling the computer system to perform functions of:

generating a geometrical shape model of the object
to be rendered on the basis of the second images;

generating a plurality of microfacets used to approximate a shape of the geometrical shape model;

executing a billboarding process that rotates the plurality of microfacets to make a predetermined angle with a view direction; and

generating the third image by selecting texture images for respective microfacets from the plurality of first images on the basis of the plurality of photographing directions and view direction, and by projecting the selected texture images onto the microfacets.

15. A computer program product according to claim 14, wherein the geometrical shape model generation function generates a plurality of voxels, and generates the geometrical shape model using the plurality of voxels, and

the microfacet generation function generates the microfacets in the respective voxels.

16. A computer program product according to claim 15, wherein the geometrical shape model generation function controls the number of voxels to be generated on the basis of precision of the second images.

17. A computer program product according to claim 15, enabling the computer system to further perform a function of appending geometry information to each pixel of the plurality of first images on the

basis of the second images, and executing a clipping process of the plurality of first images on the basis of the geometry information of each pixel of each first image and a distance from a viewpoint to each voxel.

5 18. A computer program product according to claim 14, enabling the computer system to further perform a function of selecting at least two first images in ascending order of angle that the view direction and the plurality of photographing directions
10 make, and of generating an interpolated image on the basis of the at least two first images, and

 wherein the third image generation function selects the texture images for respective microfacets from the plurality of first images or the interpolated
15 image on the basis of the plurality of photographing directions and view direction, and projects the selected texture images onto the microfacets.

 19. A computer program product according to claim 18, enabling the computer system to further
20 perform a function of appending geometry information to each pixel of the plurality of first images and the interpolated image on the basis of the second images, and executing a clipping process of the plurality of first images on the basis of the geometry information
25 of each pixel of each first image and the interpolated image, and a distance from a viewpoint to each voxel.